

5 HERMIT PLACE:

Assessment of Potential Ground Movements from Proposed Basement Construction.

1. Introduction

This report presents an assessment of calculated ground movements due to the proposed construction of a basement at 5 Hermit Place, London, NW6 4BZ. The calculated movements developed and presented use the methods in CIRIA C580 which assume stiff clays and represent those arising from good construction method and execution. We have based our assessment on the sequence of ground conditions (i.e. Made Ground overlying London Clay) as presented in the ground investigation reports referenced below.

2. Existing structures and Basement Proposals

The following understanding has been extracted from the documentation provided by Ground & Water Ltd.

The site is an approximately rectangular shaped plot of land, totalling ~50m² in area and orientated in a north-west to south-east direction. The site was located ~50m north-east of Hermit Place's junction with Kilburn Vale in the Kilburn area of Hampstead. The site was located in the London Borough of Camden. Kilburn Vale, located approximately 50m south-west of the site, was noted to be situated at 32.1m AOD.

The national grid reference for the centre of the site was approximately TQ 25553 83752.

From the drawings provided it is understood that the proposal will comprise a new single storey building above ground with a single storey basement. The approximate building dimensions will be 9.5m by 5.5m in plan, with the building being approximately rectangular. The proposed basement will be a maximum of 3.5m deep.

It is understood that the basement will be constructed using propped cantilevered underpins in a 'hit and miss' sequence although it is understood that the structural calculations provided by the Structural Engineer are for a cantilevered wall to allow for any accidental lack of propping during the construction period. Any such omission will adversely affect ground movements.

3. Ground Investigation Summary

The ground investigation The following sequence has been derived from the ground investigation report provided:

Concrete/Made Ground

London Clay

Strata	Depth Range mbgl	Summary Description
Concrete/Made Ground	GL – 0.4	Concrete over clayey gavel sand /sandy gravel.
London Clay	0.4 – 15.45*	Dark Grey Clay

*Base not proven

The Borehole was drilled with a window sampler and SPT tests were performed at regular intervals. For the range of depth relevant to the basement these varied from 4 to 11. This converts to an approximate range of shear strength from 20 to 55kN/m². The water content of the soil in relation to plastic and liquid limit broadly confirms this range, i.e soft to firm to firm.

4. Assessment of Ground Movement

An assessment of ground movements has been carried out as follows:

- Settlements have been assessed for the adjoining properties (No's 4 and 8) due to the excavation of the basement.
- The magnitude of ground movements has been assessed for the excavation in front of the retaining structure.
- The ground investigation data suggests that the excavation will be largely in London Clay. As such movement behind the wall has been calculated using Figure 2.11 in C580.
- Note that the C580 charts relate to *stiff* clays. The clays likely to be encountered in the excavation of the basement are predicted to be soft to firm and firm. Therefore the movements presented here may be an underestimate.
- Movement due to Wall installation has been discounted at this stage as it is understood that at this stage the property will be underpinned, and as such a wall will not be installed *into* the ground. Rather the wall will be installed in a hit and miss approach into freshly excavated ground. Note in C580 the ground movements due to *wall installation* refer to the use of secant or contiguous bored pile walls or diaphragm walls. As this is not relevant to the proposed construction techniques here, only movements due to excavation have been calculated.

It is important to note that CIRIA report C580 is written for embedded retaining walls. Therefore movement calculations for the excavation of soil and installation of underpins does not strictly apply to C580. There is no recognised method for calculating ground movements due to underpinned basements. However it is recognised that settlements are generally small for good ground conditions and where care and appropriate measures are taken in construction.

The following key assumptions have been made:

- The maximum excavation depth is approximately 3.5m bgl.
- The method of basement construction will be via propped cantilever underpins using a 'hit and miss' approach.
- A high wall stiffness has been assumed.
- In the permanent case the wall will always be propped at high (approximately ground floor level) and basement floor level.
- The adjoining properties are detached from the subject property.
- The properties assessed for ground movement are:
 - No. 6 Hermit Place (4m) and the building at the rear of No. 236 Belsize Road (1.5m).

Other issues to note:

- The site is close to areas of propensity for Head Deposits. The softer 'London Clay' deposits may represent Head Deposits.
- Trees are present adjacent and close to the proposed structure. Removal of trees and bushes, or their retention and its effect on ground movement has not been accounted for in the calculations.

From figure 2.12 in C580 the following calculated assessments of ground movements have been developed due the excavation of soils in front of the wall.

No 6 Hermit Place

Distance from Basement (m)	Calculated Horizontal Movement (mm) (see assumptions above)	Calculated Vertical Movement (mm) (see assumptions above)
4 (Near side)	4	2
9 (Far Side)	2	1

Building at Rear of 236 Belsize Road

Distance from Basement (m)	Calculated Horizontal Movement (mm) (see assumptions above)	Calculated Vertical Movement (mm) (see assumptions above)
1.5 (Near side)	5	3
2		3+*
6.5 (Far Side)	3	2

In terms of building damage assessment and with reference to Table 2.5 of C580 (after Burland et al, 1977), the 'Description of typical damage' given the calculated movements it is likely that the damage assessment will fall into Category 1, 'Very Slight'.

There are a number of key points to note in using this assessment:

- It is important to note that CIRIA report C580 is written for embedded retaining walls. Therefore movement calculations for the excavation of soil and installation of underpins does not strictly apply to C580. The values calculated are likely to represent lower bound numbers.
- Most ground movement will occur during excavation and construction so the adequacy of temporary support will be critical in limiting ground movements.
- The speed of propping and support is key to limiting ground movements
- Good workmanship will contribute to minimising ground movements.
- The assessment assumes the wall is in stiff/competent clay, whereas ground conditions encountered were for soft or soft to firm clay.
- Larger movements will be expected where relatively soft soils are encountered at, above or anticipated below formation.

Ground movement can be minimised by adopting a number of measures, including:

- Ensuring that adequate propping is in place at all times during construction
- Installation of the first (stiff) support quickly and early in the construction sequence for each underpin panel.
- Avoiding unsupported faces and developing good contact between the ground and the wall
- Avoid leaving ground unsupported
- Minimise deterioration of the central soil mass by the use of blinding/ covering with a waterproof membrane.
- Avoid overbreak
- Control dewatering to minimise fines removal and drawdown.

Larger movements may be generated if any one or any combination of the above recommendations and/or assumptions are not heeded or if ground conditions are different to those anticipated by the ground investigation.

Heave

Heave of the ground will occur within the basement due to soil removal and consequent unloading of the soil. Using elastic and consolidation theories, both immediate and longer term heave movements have been calculated for within the basement. These are maximum calculated figures and apply to the centre of the basement. The figures will be significantly lower at the edges and lower still at the corners.

Immediate upward (elastic) movements have been calculated at around 5mm. These will be take place typically within 7 days of completion of soil excavation. Longer term soil swelling will also occur and this has been calculated of the order of 15 to 20mm. This will typically take many months or years to occur.